Abstract

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Modelling human interventions in the Rhine basin using the SIMGRO model

The very wet and dry conditions of recent years in Europe have made it clear that measures will have to be taken in this century to cope with floods and droughts. Furthermore the anticipated climate change will have an important effect on the functioning of rivers. The question is how to manage these changes. Understanding the flow regime of the major rivers in Europe is crucial for proper water management. The Rhine is one of the longest and most important rivers in Europe. Conceptual hydrological models like the HBV, VIC and STREAM have been applied to the Rhine basin to study average discharge behaviour and flood situations. However, to investigate more complex phenomena like low flows, droughts and the spatial patterns of relevant hydrological variables and spatially oriented adaptation measures, the use of a physically based model is needed, suitable to be used in situations with changing hydrological conditions. For such situations the SIMGRO model was developed. The model simulates the flow of water in the saturated zone, the unsaturated zone and the surface water. For the modelling of the Rhine basin the area upstream of the Dutch-German border was considered, it covers 160 000 km^2. The model was set-up using digital data. A spatial resolution of 25 km^2 was considered. Detailed data on rainfall and potential evapotranspiration for 134 regions were available and a comparison of measured and calculated discharge at the Dutch-German border is quite satisfactory. There are differences, but the lower and higher flows are modelled reasonable well. In the paper also the further improvements of the model will be discussed on a more detailed input data for the groundwater system and the use of a snow and ice module. Furthermore human interventions like projected land use changes will be addressed and results will be presented on the effect of the flow regime.